

# Miniature 70-W Brushless Motor-Controller for Compact Extraterrestrial-Based Actuation, Phase I

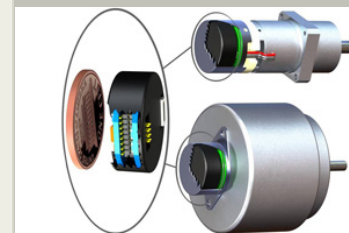
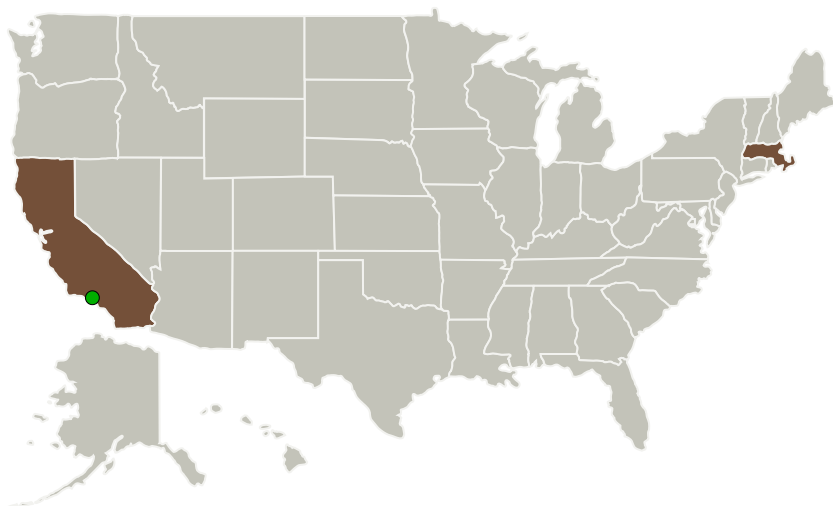
Completed Technology Project (2016 - 2016)



## Project Introduction

This SBIR will support rover locomotion and manipulation with a system of newly-developed penny-sized 70-W brushless servomotor controllers that are networked on a bus-topology CANbus running CANopen. Each "P3" controller is small enough to be mounted in the tiny volume normally reserved for the encoder; and, indeed, each P3 carries the entire active electronics of the encoder function by measuring the magnetic field of a 6x2.5-mm radially-polarized button magnet bonded to the tail of the spinning motor shaft. A Kalman filter enables the encoder to read to 12-bits-absolute at commutated speeds up to 14,000 RPM. The controller has all of the functions expected of conventional controllers. However, based on three patents of international scope and a fourth PCT application, the part count has been substantially reduced, with subsequent reduced size, fewer parts to fail, fewer parts that otherwise generate quiescent power, and reduced cost. The Phase-I objectives will select two brushless servomotors of varying specifications that support NASA's rover missions. The electromechanical interface between P3 and the motors will be designed, assembled, fixtured with particle-brake loads, and then rigorously stress tested before working with NASA engineers to create a conceptual design for Phase II and beyond. Phase I is expected to result in a TRL of 4. Phase-II efforts will focus on design-modifications to address issues found in Phase-I and will encompass rigorous stress-testing in relevant environments. Phase II is expected to result in a TRL of 5. Phase-III commercialization efforts will create a system of motor controllers that not only support NASA rover missions, but also support other space-based non-terrestrial applications, such as servomotor actuation on satellites for precision antennae and laser pointing and the deployment of articulated structures.

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Barrett Technology, LLC	Lead Organization	Industry Small Disadvantaged Business (SDB)	Newton, Massachusetts
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Massachusetts

## Project Transitions



**June 2016:** Project Start

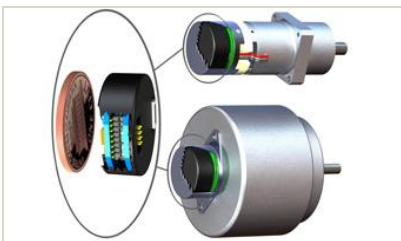


**December 2016:** Closed out

### Closeout Documentation:

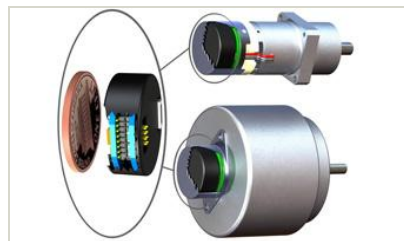
- Final Summary Chart(<https://techport.nasa.gov/file/140434>)

## Images



### Briefing Chart Image

Miniature 70-W Brushless Motor-Controller for Compact Extraterrestrial-Based Actuation, Phase I  
(<https://techport.nasa.gov/image/134571>)



### Final Summary Chart Image

Miniature 70-W Brushless Motor-Controller for Compact Extraterrestrial-Based Actuation, Phase I Project Image  
(<https://techport.nasa.gov/image/134398>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Barrett Technology, LLC

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

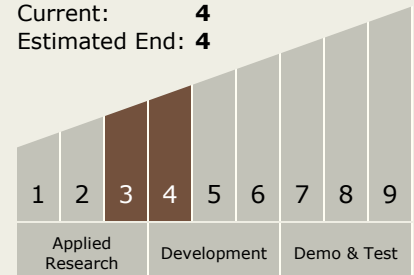
Carlos Torrez

### Principal Investigator:

William Townsend

## Technology Maturity (TRL)

Start: 3  
Current: 4  
Estimated End: 4



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## Technology Areas

### Primary:

- TX04 Robotic Systems
  - └ TX04.2 Mobility
    - └ TX04.2.4 Surface Mobility

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System